and continued to rise slowly with wind steady from the northeast. The wind continued from that direction until 3:25 a. m. of the 7th, when it suddenly shifted to the southwest with increasing velocity and a sudden rise in temperature, as shown on the thermograph trace, fig. 3.

The important point to note in this connection is the fact that temperature rose 7° from 10 p. m. of the 6th to 3:25 a. m. of the 7th with a wind blowing toward mountain slopes to the westward of the station.

Southwesterly winds and high temperatures prevailed until about 12:30 p. m. of the same day (7th) when the wind shifted to a northerly quarter with a cold wave.

We may now consider that one of two things happened. First, a considerable body of warm dry air may have become detached from the parent low, which still lay to the westward of the Rocky Mountains, and moved eastward in the general circulation. In this event the irruption of cold air from the north was merely a return to the conditions which had prevailed for some days before the approach of the low. Second, we may consider that the cold air from the north was the predominating influence, and that what was observed at Havre and Williston was the southern extension of a high area moving southeasterly from the British possession.

I should have said before that the first fall in temperature, shown on the thermograph sheet, was not accompanied by strong winds. In fact there was very little wind during the twelve hours that elapsed between the advent of the first cold wave and the return of the warm wave on the morning of the 8th.

The rise in temperature, last mentioned, occurred in connection with the advance of the original low, which had meanwhile reached Havre the second time. It advanced thence eastward and was followed by a cold wave, as shown by the thermograph sheets. The whole process, both at Havre and Williston, is beautifully shown by the instrumental tracings in figs. 3 and 4.

The essential difference between the temperature curves at Havre and Williston is in their steepness or slope. The aid of dynamic heating has been invoked to account for the sharp incline of the Havre curve with rising temperature. I wish to point out that the falls of temperature at this station are about as sharp as the rises.

Is it not largely a topographic rather than a dynamic effect in both cases?

The particular qualities which differentiate temperature changes at Havre from those of other regions are the suddenness of the change and the amplitude of the oscillation. It would seem as if a wall of warm or cold air, as the case may be, is transported bodily past the station much as a norther advances over the plains of Oklahoma and Texas. While a part of the heat of the so-called foehn wind is doubtless due to compression, it would seem that by far the greater part is due to the original temperature of the air before crossing the main divide of the Rocky Mountains.

WEATHER FORECAST CARDS BY RURAL DELIVERY.

In the report of the Ohio section for March Mr. J. Warren Smith, Section Director, advocates the possibility of distributing daily weather forecast cards by the system of free delivery mail matter in rural communities. The extension of the free delivery system to rural communities was undertaken some years ago by the Postoffice Department and is now recognized as of great benefit from a social, educational, and industrial point of view. Mr. Smith proposes to supply those farmers who request the daily weather forecast with postal cards delivered by the mail carriers whenever the latter start on their routes at the proper time. He finds that of the 49 rural routes in Ohio, the average number of families served is 100. About four-fifths of the carriers leave the postoffice before 10 a. m. In some cases the routes are so long that the carriers must start by 7 a. m., and are all day on the road, but at the greater number of places the carriers leave about 9 a. m. In order to test the value of the plan of Mr. J. Warren Smith, the Chief of Bureau has authorized the forecasts to be telegraphed at Government expense to all the postoffices in Ohio where the rural carriers start later than 10 a. m. As to the districts where the carriers start too early for this service it is recommended that farmers' clubs and institutes take into consideration the possibility of making better postal arrangements in order to secure the advantages of this service.

ICE AND NAVIGATION AT ST. MICHAEL, ALASKA.

Bulletin No. 40, by Lieut. D. H. Jarvis of the United States Revenue Cutter Service, contains additional notes for the Alaska Coast Pilot by the United States Coast and Geodetic Survey. It gives a table deduced from the records of the Alaska Commercial Company, showing the date when the ice first moved out of St. Michael Bay; the first arrival from the Yukon River; the first arrival from the sea; the close of navigation, as determined by the first formation of ice in St. Michael Bay. The location of St. Michael is about latitude 63° 5′ north and longitude 162° west. It is on the southeast shore of Norton Sound, about 100 miles from the mouth of the Yukon and a little more from Cape Nome. The Coast Pilot says:

The harbor of St. Michael, Norton Sound, is open to navigation, on an average, by the middle of June, the time of breaking up of the ice varying from about the last week of May to the last week June. The season of navigation usually closes in the latter part of October.

The winds in summer are generally moderate; but during September and October gales are strong and frequent, northerly winds predominating. These strong winds are of special importance to mariners on account of their effect on the height of the water; northerly and easterly winds lower the water and southerly and westerly winds raise it. With northerly winds of long duration the amount of change may be as much as 5 feet below mean low water.

The table above referred to is as follows:

Ice conditions at St. Michael, Alaska.

Year.	Ice moving out of St. Michael Bay.	First arrival from Yukon River.	First arrival from sea.	Ice forming in St. Michael Bay.
1878	....	....	July 1	Oct. 18-22.
1879	....	....	June 22	Oct. 21-25.
1880	June 22	....	June 28	Oct. 20-27.
1881	June 10	....	June 19	Nov. 7.
1882	June 8	June 17	June 24	Oct. 23.
1883	June 1	June 10	June 22	Nov. 6.
1884	June 10	June 17	....	Oct. 6.
1885	....	....	June 24	
1886	June 11	....	June 20	Oct. 22.
1887	....	June 15	June 20	Oct. 29-Nov. 6.
1888	May 31	June 8	June 25	Oct. 22-31.
1889	June 9	June 13	July 4	Nov. 10-16.
1890	June 3	June 6	July 13	Oct. 25-Nov. 9.
1891	June 6	June 7	June 29	Nov. 6.
1892	June 11	June 7	June 18	Oct. 29.
1893	June 10	June 14	June 24	Nov. 7.
1894	June 15	June 18	June 25	Oct. 26.
1895	June 18	June 19	June 29	Oct. 24-Nov. 4.
1896	June 25	June 27	July 7	Nov. 2.
1897	June 14	June 22	June 26	Oct. 18-21.
1898	June 13	....	June 13	Oct. 20-31.
1899	June 10	June 16	June 17	

The above table of ice conditions presents us with one of those general climatological characteristics that should apparently give us a sort of summary of the climatic conditions of each season. It is said that the rains on the coasts of California and Oregon have some connection with atmospheric conditions over Alaska. The preceding table may, therefore, furnish a basis for studies in this direction.

The last few pages of this same Coast Survey bulletin are devoted to the Arctic Ocean north of Alaska. Our knowledge of the meteorology of this region is so slight that every scrap of information is of value. The perusal of these pages by Lieutenant Jarvis suggests that this region is not so liable to severe cyclonic storms as it is to severe winds of the straight line type. The immense field of pack ice, whose border is rarely more than 20 miles north of the coast, drifts to and fro, obedient to the general resultant of the winds that prevail over an indefinite region northward, eastward, and westward. This drift of the pack differs, however, from that which would occur if the ocean beneath it were of great depth; the shallow water is driven by it in confused currents hither and thither and acts like a buffer, retarding the ice, but is itself also forced outward in all directions. Therefore vessels drift to and fro with the greatest irregularity, while the foot of the pack merely moves north or south. In general the great ice